HUMAN HEALTH PROBLEMS ASSOCIATED WITH MEVINPHOS (PHOSDRIN) IN CALIFORNIA DURING 1979

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SUMMARY

In 1979, there were 30 exposures to mevinphos (Phosdrin) reported by physicians to the California Department of Food and Agriculture. Twenty-nine of these exposures were suspected systemic illnesses, and the other was an eye injury. The majority of exposures that occurred were in situations that could have been prevented. These include ground applicators driving through their own drift, hand-pouring mevinphos, and spills. There was only 1 case that resulted from mechanical failure. There were several cases, though, in which all label restrictions and regulations apparently were followed, and exposure still occurred. In the 5-year period from 1975 to 1979, there were 251 occupational exposures to mevinphos with resulting illnesses that were reported in California by physicians. In this 5-year period a noted decrease in the number of illnesses and injuries has occurred; from 67 cases in 1976 down to 30 cases in 1979. Mevinphos is one of the most hazardous pesticides currently registered, but through safe work practices and the use of closed systems, the number of illnesses has been reduced. Pest management guides now being developed will recommend that it only be used as a last resort chemical--only when suitable safer alternates are not available.

INTRODUCTION

The 30 occupational exposures to mevinphos that were reported by physicians as occurring in 1979 in California and the follow-up investigation data were evaluated and summarized.

In addition, a telephone survey of persons exposed to mevinphos during 1979 was conducted in December 1980. The 5 questions asked each person were designed to update and supplement the information appearing in either the Doctors' First Reports of Work Injury or the follow-up investigations conducted by the local county staff. The questions were: (1) How long were you in the hospital? (2) How long were you off work? (3) After the incident, how long before you felt completely normal? (4) How long did you receive doctor's follow-up care? and (5) Do you have any residual symptoms?

Twenty-one of the 30 exposed persons were contacted in the follow-up that was made 1 to 2 years after the exposure. The results are summarized in the following case studies.

CASE STUDIES

Systemic Illnesses

There were 29 cases of suspected systemic illness involving mevinphos in 1979.

Two ground applicators became ill as a result of passing through their own spray drift while applying Phosdrin to cauliflower. One of the 2 applicators became stuporous, and had a heart seizure before being taken to a hospital. While there, he went into respiratory arrest on 3 separate days. He was treated by a physician with atropine and 2-PAM during the 7 days he was hospitalized. No results were given for the blood cholinesterase tests. He was off work 28 days and does not feel completely normal at this time. His residual symptoms include difficult breathing. He had 5 follow-up visits after the incident, and he is currently under a doctor's care. The other applicator was admitted to the hospital with abdominal cramps and constricted pupils. His baseline cholinesterase levels were: plasma 67; RBC 81. His after-exposure levels were: plasma 61; RBC 70. He was released from the hospital after 1 day and did not return to work for 7 days. Periodic nausea remains.

Two workers became ill after hand-pouring Phosdrin and methomyl into a mix tank. One worker was hospitalized after exhibiting symptoms of vomiting, nausea, and diarrhea. The physician treated him with atropine. The results of the blood cholinesterase test were not reported. He remained in the hospital 5 days before being released to return to work. The other worker was taken to the hospital while suffering from nausea, blurred vision, and abdominal cramps. He was also treated with atropine. A CBC was run as well as blood cholinesterase. The blood cholinesterase test results were: RBC 0.14 (normal 0.55-1.25), and plasma 0.10 (normal 0.41-1.65). He left

the hospital shortly after these samples were taken, against the physician's advice. The worker had not been properly trained in the safe handling of pesticides. A closed system was not provided. Additional health information regarding these 2 incidents is not reported as neither person could be contacted.

A worker driving an application rig with a front-mounted boom to apply Phosdrin and Metasystox-R repeatedly crossed the line of his own drift on a windless night. He wore all the required safety equipment but did not shower and change into clean clothes at the end of his shift. He was hospitalized 4 days and was treated by a physician with atropine. His baseline blood cholinesterase levels were: plasma 114, and RBC 103.5. His blood cholinesterase levels after exposure were: plasma 40, and RBC 20. Upon his release from the hospital, he was cleared for all work except with organophosphates. He lost 4 days from work. Current information about the health of this person is not reported as he could not be contacted.

A worker mixing and loading Phosdrin and methomyl for an aerial application became ill near the end of his shift. He was admitted to the hospital and treated with atropine. He was released 3 days later. His plasma cholinesterase (baseline: 84; day of illness: 5.8; day after illness: 8) were shown to be severely depressed. He lost 5 days of work. He has no residual symptoms.

A mixer-loader for an aerial applicator became dizzy and nauseated while working with Phosdrin and methomyl. He was immediately flown to a hospital by his employer. A physician treated him with atropine during his 3-day stay in the hospital. His cholinesterase levels 2 weeks after becoming ill were: plasma 94 (baseline 66), and RBC 40 (baseline 191). He was off work 45 days. He was advised to avoid working around organophosphates until his blood cholinesterase levels return to normal. Although he did not feel completely normal for 45 days, he has no residual symptoms. Follow-up doctor's care included blood samples for determining cholinesterase levels.

A worker mixing and loading Phosdrin for an aerial application became ill during work. He was taken to a hospital and admitted by a physician, who treated him with atropine. He was released 2 days later. His blood cholinesterase level after exposure was: plasma 0.5, and RBC 1.6 (normal range: plasma 5.7, and RBC 9.0-18.0). He was not allowed to return to work with pesticides for 22 days, when his cholinesterase levels had returned to normal. He lost 2 days' work, and it was 7 days before he felt completely normal. He has no residual symptoms.

A worker unloading 5-gallon cans of Phosdrin from a truck spilled some on his chest from a partially full can. After the accident, he took off his coveralls and shirt and washed the affected areas. Poisoning symptoms included excessive perspiration, nausea, and vomiting. He was hospitalized 2 days. His cholinesterase level was depressed. The worker missed 5 days of work. He did not feel completely normal for 30 days, and still he experiences occasional nausea and headaches at work. The worker returned to the physician twice after the incident for follow-up exams.

A mixer/loader working with Phosdrin for aerial applications developed blurred vision, became weak and dizzy, and lost consciousness. He was admitted to a hospital for observation and treatment where he stayed for 2 days. The physician diagnosed the illness as organophosphate toxicity. He missed 3 days of work. Follow-up information and comments are not reported as the worker could not be contacted.

A ground applicator was apparently checking the spray nozzles when a high pressure hose coupling broke and sprayed Phosdrin over his body. Symptoms of his illness were vomiting and constricted pupils. The physician admitted him to the hospital for a 1-day observation period. The physician diagnosed the illness as moderate organophosphate poisoning. Blood cholinesterase levels indicated moderate exposure. Follow-up information related to this incident is not reported as the worker could not be contacted.

A mixer/loader for an aerial application spilled Phosdrin on his arm and leg when he disconnected the transfer hose from the mix tank. He immediately washed his skin, but continued to wear the contaminated clothing. He developed illness symptoms that included nausea, vomiting, abdominal cramps, and dizziness. These symptoms were beginning to subside when he was admitted to the hospital for observation. No atropine was administered. He was released the next day, but did not return to work for another 3 days. It was 4 days before he felt completely normal, and he has no residual symptoms. He had no formal training, did not wear protective clothing, and did not have a clean change of clothes at the job site.

A ground applicator's arm became wet with Phosdrin and Metasystox-R during an application. Late in the afternoon, he became ill and was admitted to the hospital for 1 day. Symptoms included blurred vision, abdominal cramps, dizziness, and excessive perspiration. The physician's diagnosis was cholinesterase toxicity. He was treated with atropine. A cholinesterase test was given, with the results showing a level of 10.9, which is within the normal range of 7 to 19. It was 2 days before he felt completely normal, and he was off work 3 days. He had no doctor's follow-up care, and has no residual symptoms.

A worker loading Phosdrin and methomyl (for an aerial application) with a closed system began feeling ill and lightheaded at the end of a work day. He later showered for 30 minutes before going to the hospital. He was admitted to the hospital after he began vomiting, having cold sweats, and his eyes were dilating. He was treated with atropine. He left the hospital after 3 days and went back to work. It was 60 days before he felt completely normal. After the exposure, he visited the doctor 3 times for blood cholinesterase determinations. He has no residual symptoms.

The owner of a crop dusting firm did not use a closed system while mixing and loading Phosdrin. He also did not wear a respirator during the first 2 mixing-and-loading operations. He went to the hospital feeling ill after working about 2 hours. His symptoms included diarrhea, nausea, vomiting, headache, and pinpoint pupils. He was admitted to the hospital where a physician diagnosed the illness as organophosphate intoxication, and treated him with atropine. He was released the next day and advised to limit his

activities. A cholinesterase test was run by the acetylthiocholine method. The results were: plasma 947.0 (normal 1875-3125), and RBC 2,706.0 (normal 3000-5000). Follow-up information related to this exposure is not reported as the person could not be contacted.

A warehouseman moving containers of Phosdrin spilled some of the pesticide on his leg. He washed his leg with alcohol. Later in the day, he became ill and consulted a physician. The physician diagnosed the illness as Phosdrin poisoning and treated him with atropine. Blood cholinesterase tests were given with the results being: plasma 959 (normal range is 1,900-3,800), and RBC 4,607 (normal range is 7,300-15,500). One day of work was missed. It was 60 days before he felt completely normal. He had no doctor's follow-up care, and has no residual symptoms.

A ground applicator became ill from the drift of Phosdrin during an application. He went to a hospital complaining of a headache, joint pains, and vomiting. He remained in the hospital 4 days. The physician diagnosed the illness as organophosphate toxicity, and treated the worker with atropine. A blood cholinesterase test was given, but the results were unavailable. The employee lost 5 days of work. After hospitalization, the worker stayed home 30 days. He did not feel completely normal for 45 days after the incident. He had no doctor's follow-up care, and he has no residual symptoms.

A mixer/loader splashed a small amount of Phosdrin onto his leg while inserting a probe into a 5-gallon can. He changed his coveralls, but later developed symptoms of organophosphate poisoning including nausea, shakiness, and constricted pupils. The physician diagnosed the case as minor organophosphate intoxication. The man was instructed by the physician to take a shower and to change clothes before leaving the hospital. He lost no time from work. The worker felt completely normal 5 hours after the exposure. During the month after the incident, the worker visited the doctor once for a blood cholinesterase test; results were normal. He has no residual symptoms.

A ground applicator applying Phosdrin to cauliflower became ill. Symptoms included nausea, stomach cramps, vomiting, and constricted pupils. A physician diagnosed the illness as moderate exposure to Phosdrin. Blood for a cholinesterase test was taken, but the results were not reported. One day of work was lost. He felt completely normal after 3 days. There was no doctor's follow-up care, and the worker had no residual symptoms.

An owner of an aerial applicator company mixed and loaded Phosdrin without using a closed system or wearing a respirator. He felt ill 4 hours after he began work, so he took a shower. He went to a hospital emergency room where a physician diagnosed the illness as organophosphate poisoning. The physician administered atropine. The results of a blood cholinesterase test were: plasma 0.44 (normal is 0.55-1.50), and RBC 0.53 (normal is 0.60-1.50). Two days of work were lost. He felt completely normal 1 hour after the incident. The worker was not under a doctor's follow-up care, and he has no residual symptoms.

A self-employed farmer was overwhelmed with fumes of Phosdrin and Di-Syston in a building used to store pesticides. He did not wear a respirator while

in the building. He became light-headed and experienced abdominal cramps after leaving the building. The physician diagnosed the illness as multiple insecticide absorption. Treatment included rest and Donnatal. He remained in the hospital overnight. He lost 3 days of work as a result of this illness, although he felt completely normal 1 day after the incident. He received no doctor's follow-up care, and has no residual symptoms.

An employee filling large drums with Phosdrin and Metasystox-R at a dealer's yard became ill. Symptoms included dizziness and nausea. He was taken to a hospital. The physician felt there was no evidence of acute pesticide intoxication, but had a cholinesterase test run anyway. Baseline cholinesterase levels were: plasma 0.67, and RBC 0.71. Cholinesterase results after exposure were: plasma 0.59, and RBC 0.51. The physician sent the worker home to rest. He returned to work the following day. He consulted a physician 2 weeks later for an additional cholinesterase test. It was 14 days after the incident before he felt completely normal, and still he experiences occasional tiredness.

A worker stacking empty Phosdrin cans knocked over a stack of the cans, spilling rinse water on himself. He washed his eyes and returned to work. He later went to the hospital with pinpoint pupils, slowed speech, and an "unwell" feeling. The physician diagnosed the illness as organophosphate poisoning. A cholinesterase test was run, and the results did not compare with the baseline. He took a shower at the hospital, and stayed a few hours for observation before being released. No days of work were lost. He felt completely normal 1 day after the incident, and he experienced no residual symptoms.

A worker who had been pouring Phosdrin into containers for 2 months became ill. Symptoms included nausea, vomiting, twitching, and constricted pupils. The physician diagnosed the illness as organophosphate poisoning. A cholinesterase test was given, but results were not available. Follow-up information about this exposure is not reported as the worker could not be contacted.

A manufacturing/formulation plant worker exposed to Phosdrin became lethargic. The physician diagnosed the illness as organophosphate exposure. Cholinesterase tests showed a low RBC level and a very low plasma level. He remained in the hospital overnight, and was off work the following day. The worker visited the doctor weekly for cholinesterase determinations for 8 weeks following the incident, although he felt completely normal almost immediately after the exposure. He has no residual symptoms.

Another manufacturing/formulation plant worker exposed to Phosdrin became nauseated and nervous, and was perspiring excessively. A physician diagnosed the illness as possible organophosphate exposure. A cholinesterase test was given, but no results were available. The employee returned to work, but was advised to avoid exposure to organophosphates. The worker received no doctor's follow-up care although he still experiences occasional depression.

A farmer, hand-pouring Phosdrin, spilled some of the pesticide on his hands. He washed his hands, but later became ill. Symptoms included dilated pupils and clammy skin. Cholinesterase tests results showed: plasma 1.82 (normal 2),

and RBC 7.69 (normal 8). He was administered atropine by a physician and released. He was off work 4 days. The farmer explained that 30 days passed before he experienced a "good" day, and he still sustains occasional nausea, dim vision, and excessive perspiration from the areas which the mevinphos contacted. He visited the doctor 4 times for cholinesterase determinations during the month following the incident.

A shop foreman was repairing the pump on a closed system. He failed to relieve the pressure on the pump before starting, and a dilute mixture was splashed on his arm, neck, and leg. He bathed and changed clothes before repairing the pump. He returned to the shop feeling ill. He showered and changed clothes again, then went to a physician who diagnosed the illness as organophosphate poisoning. Cholinesterase test results were: plasma 74 (baseline 90), and RBC 46 (baseline 72). He was released to return to work full time. No time was lost from work. Follow-up information regarding this illness is not reported as the worker could not be contacted.

A worker formulating Phosdrin became ill a day and a half after exposure. Symptoms included shortness of breath, trembling, perspiring, and diarrhea. He was taken to the hospital for a cholinesterase test, and he remained there overnight. No test results were given. No work time was lost. It was 8 hours before he felt completely normal. He received no doctor's follow-up care although he still experiences occasional pressure in his chest.

Eye

A ground applicator applying Phosdrin rubbed his eyes with his arm which was contaminated with the pesticide. He experienced slightly blurry vision and conjunctivitis. The physician diagnosed the injury as chemical conjunctivitis. Cholinesterase tests were taken, but no results were given. Follow-up information regarding this exposure is not reported as the worker could not be contacted.

DISCUSSION

Of the pesticides registered for use in California, Phosdrin continues to be the most difficult to work with safely. There were no fatalities in 1979, but 2 workers became seriously ill. Over the last 5 years, a substantial decrease in reported illnesses has occurred. In 1975 and 1976, 66 and 67 cases were reported in the respective year, and the number dropped to 30 cases in 1979. Stricter controls on the use of Phosdrin are probably responsible for this decrease.

It is recommended that commissioners carefully evaluate who receives and who retains a permit to use Phosdrin.

The pest management guides being developed by the Department will recommend that, in the future, Phosdrin should only be used as a last resort pesticide when substitute pesticides are inadequate and ineffective.

TABLE 1

ILLNESSES DUE TO PHOSDRIN EXPOSURE TO MEVINPHOS
REPORTED BY TYPE OF ILLNESS AND JOB CATEGORY
FOR 1975, 1976, 1977, 1978, AND 1979 IN CALIFORNIA

	1975	1976	1977	1978	1979	Total
Suspected Systemic Illnesses	62	58	48	37	29	234
Mixer/Loader	23	22	32	18	12	107
Manufacturing/Formulating	19	8	1	3	3	34
Ground Applicator	13	12	6	2	7	40
Flagger	2	4	2	4	0	12
Field Worker	0	4	0	1	0	5
Aerial Applicator	0	1	1	0	0	2
Worker Exposed to Drift	1	1	0	1	0	3
Truck Loader/Warehouse	1	0	2	2	2	7
Cleaner/Repairer	1	1	3	1	1	7
Indoor Worker	0	1	0	0	0	1
Other Type Pesticide Exposure	1	2	1	3	0	7
Exposed, Not Ill	1	0	0	2	0	3
Unconfirmed Report	0	2	0	0	0	2
Self-employed (Farmer)	0	0	0	0	4	4
Skin Exposure Incidents	2	6	1	0	0	9
Irrigator	1	0	0	0	0	1
Field Worker	1	3	1	0	0	5
Mixer/Loader	0	1	0	0	0	1
Manufacturing/Formulating	0	1	0	0	0	1
Exposed, Not Ill	0	1	0	0	0	1
Eye Exposure Incidents	2	3	0	1	1	7
Cleaner/Repairer	1	0	0	0	0	1
Field Worker	1	1	0	0	0	2
Mixer/Loader	0	2	0	0	0	2
Manufacturing/Formulating	0	0	0	1	0	1
Ground Applicator	0	0	0	0	1	1
Skin and Eye Incidents	0	0	0	1	0	1
Manufacturing/Formulating	0	0	0	1	0	1
Total Illnesses to Phosdrin Exposure	66	67	49	39	30	251

TABLE 2

ILLNESSES DUE TO PHOSDRIN EXPOSURE TO MEVINPHOS REPORTED BY DAYS OF HOSPITALIZATION AND DISABILITY FOR 1975, 1976, 1977, 1978, AND 1979 IN CALIFORNIA

Hospitalization	1975*	1976*	1977*	1978*	1979
None	38	48	37	22	8
1 day	4	4	5	5	8
2 days	12	8	1	6	3
3 days	5	3	5	1	3
4-5 days	3	2	0	2	3
6 days	0	0	1	0	0
7 days	0	0	0	0	1
Unspecified	4	2	3	3	4
Period of Disability					
None	12	10	5	9	6
1 day	3	5	3	0	3
2 days	9	9	3	2	2
3-4 days	13	6	6	2	7
5-7 days	5	6	7	3	4
8-14 days	7	3	5	1	0
3-4 weeks	2	3	4	5	1
More Than 4 Weeks	0	3	0	1	1
Unspecified	15	22	19	16	6

*Period of disability is the period of time that the worker is estimated by the physician to be off work, and it includes the days hospitalized. The estimation is made at the time of the worker's initial visit to the physician.

TABLE 3

ILLNESSES DUE TO EXPOSURE TO MEVINPHOS REPORTED BY TOTAL ESTIMATED DAYS OF HOSPITALIZATION AND DISABILITY FOR 1975, 1976, 1977, 1978, AND 1979 IN CALIFORNIA

Total Estimated Days of Hospitalization

1975	1976	1977	1978	1979*
69	44	37	38	42

Total Estimated Days of Disability

1975	1976	1977	1978	1979*
433	579	491	422	131

*In 1979, investigators determined the actual days of disability and hospitalization incurred by the worker.

TABLE 4

ILLNESSES DUE TO EXPOSURE TO MEVINPHOS REPORTED BY MONTH OF OCCURRENCE FOR 1975, 1976, 1977, 1978, AND 1979 IN CALIFORNIA

Month	1975	1976	1977	1978	1979	Total
January	1	1	3	1	0	6
February	2	5	0	2	0	9
March	2	6	4	1	0	13
April	10	4	6	2	0	22
May	12	3	2	2	2	21
June	4	4	4	5	5	22
July	3	13	5	15	3	39
August	10	8	8	4	7	37
September	9	11	5	4	5	34
October	7	3	9	3	5	27
November	5	8	3	0	3	19
December	1	1	0	0	0	2
Total	66	67	49	39	30	251

TABLE 5

ILLNESSES DUE TO EXPOSURES TO MEVINPHOS
AS REPORTED BY COUNTY OF OCCURRENCE
FOR 1975, 1976, 1977, 1978, AND 1979 IN CALIFORNIA

County	1975	1976	1977	1978	1979	Total
Alameda	0	0	1	0	0	1
Fresno	16	7	2	5	4	34
Imperial	12	8	8	5	2	35
Kern	5	12	3	9	3	32
Kings	2	2	1	0	0	5
Los Angeles	3	3	2	0	3	11
Madera	0	1	0	0	0	1
Merced	3	1	8	1	0	13
Monterey	2	9	8	8	5	32
Orange	0	3	3	0	0	6
Riverside	8	3	5	0	0	16
San Benito	1	1	1	0	1	4
San Bernardino	0	0	1	0	1	2
San Joaquin	1	1	0	1	1	4
San Luis Obispo	0	1	0	1	0	2
Santa Barbara	2	3	1	0	0	6
Santa Clara	3	0	0	0	6	9
Santa Cruz	4	7	1	4	2	18
Tulare	0	2	0	6	2	10
Ventura	4	1	1	0	0	6
Yolo	0	2	2	0	0	4
Total	66	67	49	39	30	251